

Remarks/Arguments

Claim Summary

By this Amendment, claims 1, 8, 33 and 38 have been revised, and claim 3 has been cancelled. Claims 1-2, 4-35 and 38 are now pending in the application.

Allowable Claims

Applicants acknowledge with thanks the indicated allowability of Claims 31 and 32.

35 USC 103

Claims 1-10, 13-18, 33-35 and 38 were rejected under 35 USC 103 as being obvious over Kawasaki et al. (US 4795529) in view of Beaudry (US 3569777) (identified by the Examiner as "Harvey") for the reasons stated at pages 3-4 of the Office Action.

Claims 1-5, 19-25, 29-30 and 33-35 were rejected under 35 USC 103 as being obvious over Okudaira et al. (US 4985114) in view of Beaudry for the reasons stated at pages 4-6 of the Office Action.

Claims 11-12 were rejected under 35 USC 103 as being obvious over Kawasaki et al. in view of Beaudry, and further in view of Sadinsky (US 5424691) for the reasons stated at page 6 of the Office Action.

Claims 26-28 were rejected under 35 USC 103 as being obvious over Kawasaki et al. in view of Beaudry, and further in view of Leiphart (US 5882488) for the reasons stated at pages 6-7 of the Office Action.

However, Applicants respectfully contend that Claims 1-30, 33-35 and 38 clearly define over the cited references, and in view of the following representations, reconsideration of the rejection under 35 USC 103 is requested.

Each of the rejections is commonly characterized by the Examiner's contention that one of ordinary skill would modify either one of Kawasaki et al. or Okudaira et al. to incorporate the impedance matching network of Beaudry.

In particular, in the Office Action, the Examiner states:

"Kawasaki et al remain silent about the step of compensating for a mismatch between the impedance of power supply and the impedance of plasma to stabilize the plasma. However, in a method of plasma generation, Harvey [Beaudry] teaches that an impedance matching network for plasma generating apparatus, which will automatically provide without any required manual adjustment, wherein an impedance mismatch is detected between the generator (power source) and the plasma (col. 1, lines 60-68)."

Similarly, in the Office Action, the Examiner states:

"Okudaira et al remain silent about the step of compensating for a mismatch between the impedance of power supply and the impedance of plasma to stabilize the plasma. However, in a method of plasma generation, Harvey [Beaudry] teaches that an impedance matching network for plasma generating apparatus, which will automatically provide without any required manual adjustment, wherein an impedance mismatch is detected between the generator (power source) and the plasma (col. 1, lines 60-68)."

Applicants acknowledge that Beaudry describes an impedance matching unit to match the impedance of a 13.56 MHz RF power supply to the plasma in a capacitively coupled process chamber. However, as explained below, the

matching unit is not adjustable in its impedance transformation after initial set-up, and instead relies on having a construction which allows it to approximately match to a range of plasma conditions because of a generally low Q to the circuit.

That is, the Abstract of Beaudry describes a “passive” (i.e., non-active) impedance-matching network and “capacitive electrodes of the gaseous plasma chamber” (i.e. for a capacitively coupled plasma system).

Further, in its description of conventional techniques, Beaudry at Column 1, lines 42-45, states that “Such a convertor usually includes a variable capacitor and a variable inductor which are required to be varied during the operation of the program to provide impedance matching.” As one of ordinary skill would readily understand, this is true for a capacitively coupled plasma system, not an inductively coupled plasma system. ←

Further, at Column 1, lines 61-68, Beaudry states that “It is accordingly an object of the invention to provide an impedance-matching network for plasma-generating apparatus which will automatically provide, without any required manual adjustment whatever, substantial impedance matching between the generator and capacitive electrodes of the gaseous plasma chamber continuously and throughout a range of changing parameters required to carry out a known plasma – chemical process.” While this passage refers to “automatically” providing an impedance match, Column 1, lines 70-73, of Beaudry clarify that the configuration “functions in a passive manner to provide automatic matching without necessitating, except for initial adjustment, the need for or use of moving parts”.

The impedance matching scheme of Beaudry may possibly be applicable for a capacitively coupled plasma processing system operating with a low plasma density and for reasonably steady plasma conditions after initial striking of the plasma. However, one of ordinary skill in the art would not apply the teachings of Beaudry to an inductively coupled plasma system operating with high plasma densities where the system has a high Q (generally indicated by ←

good matching only occurring for matching unit capacitor values very close to the optimum).

In particular for a switched process in which different gases are used in the two steps, with significantly different RF powers used in each of the steps, the impedance of the plasma is likely to be significantly different in the two steps. The fixed configuration of Beaudry is not applicable to such a process.

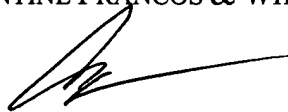
For at least the reasons stated above, Applicants respectfully contend that one of ordinary skill in the art would not combine the teachings of Beaudry with Kawasaki et al. and/or Okudaira et al. in the fashion suggested by the Examiner.

Conclusion

No other issues remaining, reconsideration and favorable action upon the claims 1-2, 4-35 and 38 now pending in the application are requested.

Respectfully submitted,

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